Abstracts

Mode Orthogonality in Reciprocal and Nonreciprocal Waveguides

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Using a general reciprocity theorem as a basis, the orthogonality relations for lossy reciprocal and nonreciprocal waveguides are discussed. To obtain a useful orthogonality relation which can extract a particular mode from a general mode expansion, a reciprocal waveguide must be bidirectional. A nonreciprocal waveguide, however, must be mutually bidirectional with its complementary waveguide (obtained by reversing the dc magnetic field applied to the gyrotropic media). For these bidirectionality conditions to be met, a waveguide must possess at least one of three symmetries: reflection, 180° rotation or rotary reflection symmetry. In those cases warranted by the structure symmetry, simplified forms for the orthogonality relations are presented. The orthogonality relations for the special case of lossless reciprocal or nonreciprocal waveguides are also discussed.

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